

A Learner-Centered Framework for E-Learning

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The age is here of distance learning and new forms of e-learning. The rate at which a variety of institutions are entering the distance learning arena is increasing rapidly. In spite of the increased popularity and presence of online learning opportunities, however, many researchers and practitioners are decrying the lack of a research-validated framework to guide their design. Other researchers and practitioners point out that what works in effective traditional learning environments may or may not work in online environments. These concerns are addressed in this article through a review of relevant research and the presentation of a learner-centered framework. This framework is based on the American Psychological Association's (1997) research-validated Learner-Centered Psychological Principles, developed from over a century of research.

Educators, researchers, and policymakers continue to argue for updated learning and schooling models and the increased use of new and emerging electronic learning technologies (e-learning) that can better prepare students for an increasingly global, changing, and complex world. Lags between real-world and educational uses of technology and lack of access to new technologies continue to plague educators. Furthermore, in the 21st-century world, content is so abundant as to make it a poor foundation on which to base an educational system; rather, context and meaning are the scarce but relevant commodities today. This alters the purpose of education to that of helping learners communicate with others, find relevant and accurate information for the task at hand, and be colearners and partners with teachers and peers in diverse settings and learning communities that go beyond school walls (McCombs, 2004).

To address these issues, a bold new view of learning and schooling is needed. This new view must be one that builds on the best knowledge about

human learning, motivation, and development. The framework must also be one that is not only research-based, but research-validated in the sense that it has evolved principles that have been repeatedly verified and are not just the latest research fad. It must be credible to researchers, educators, and policymakers alike; it must validate human experience while stretching current understanding; and it must inspire hope in a greater and grander vision of what is possible for all learners, including both new and experienced teachers.

E-LEARNING AND PRINCIPLES OF LEARNING

A review of contemporary research in e-learning argues the need for a theoretical or conceptual framework that educators can use in distance education (Phipps & Merisotis, 1999). There is a need not only for a strong theoretical and empirical research base, but also for design principles derived from theory and research (McCombs, 2000a, 2001a, 2001b). Support is growing for the design of distance education that focuses on the learner and on the best available knowledge about human learning (e.g., Bonk & Cunningham, 1998).

By broadly focusing on the learner, in the process of moving dynamically from novice to expert across diverse nonlinear paths, research-validated principles are needed to understand and create learning experiences that capitalize on the richness and complexity of human learning. "That is our challenge—how to design educational systems where technology is in service to, values, and supports diverse learners and learning context" (McCombs, 2000a, p. 12). Bonk and Cunningham (1998) stress the importance of reviewing learner-centered principles, constructivism, and socio-cultural theories and applying them to the e-learning environment. Education must engage in a paradigm shift that focuses on "learners and learning" in order to meet the needs of the changing world.

THE LEARNER-CENTERED PRINCIPLES AS A FRAMEWORK

Beginning in 1990, the American Psychological Association (APA) appointed a Task Force on Psychology in Education, one of whose purposes was to integrate research and theory from psychology and education in order to surface general principles that have stood the test of time and can provide a framework for school redesign and reform. The result was a document (*Learner-Centered Psychological Principles*) that originally specified 12 fundamental principles about learners and learning that, taken together, provide an integrated perspective on factors influencing learning for *all* learners (APA Task Force on Psychology in Education, 1993). This document, as

revised in 1997 (APA Work Group of the Board of Educational Affairs, 1997), now includes 14 principles, with attention focused on those principles dealing with diversity and standards. The purpose of these learner-centered psychological principles is to provide a framework to guide educational reform and school redesign efforts (APA Work Group of the Board of Educational Affairs, 1997).

The 14 learner-centered principles are categorized into four research-validated domains shown in Table 1. Domains important to learning represent metacognitive and cognitive, affective and motivational, developmental and social, and individual-differences factors. These domains and the principles within them provide a framework for designing learner-centered practices at all levels of schooling, including distance learning. They also define what it means to be "learner-centered" from a research-validated perspective.

DEFINING "LEARNER-CENTERED"

The four research-validated domains and the associated principles provide a framework for practices that are learner-centered and can be applied to e-learning environments. From an integrated and holistic look at the *Principles*, the following definition emerges:

"Learner centered" is the perspective that couples a focus on individual learners—their heredity, experiences, perspectives, backgrounds, talents, interests, capacities, and needs—with a focus on leaning—the best available knowledge about learning and how it occurs and about teaching practices that are most effective in promoting the highest levels of motivation, learning, and achievement for all learners. This dual focus then informs and drives educational decision making. Learner-centered is a reflection in practice of the *Learner-Centered Psychological Principles*—in the programs, practices, policies, and people that support learning for all. (McCombs & Whisler, 1997, p. 9)

This definition confirms that the *Principles* apply to all learners, in and outside of school, young and old. Research with learner-centered self-assessment tools based on the *Principles* for teachers and students from K–12 and college classrooms confirms that what defines "learner-centeredness" is not solely a function of particular instructional practices or programs (McCombs & Lauer, 1997; McCombs & Whisler, 1997). Learner-centeredness is a complex interaction of the programs, practices, policies, and people as perceived by the individual learners (McCombs, 2000b). The learner-centered principles become foundational in determining methods for using and evaluating programs and practices that provide instruction,

Table 1. Learner-centered psychological principles**Cognitive and Metacognitive Factors***Principle 1: Nature of the learning process*

The learning of complex subject matter is most effective when it is an intentional process of constructing meaning from information and experience.

Principle 2: Goals of the learning process

The successful learner, over time and with support and instructional guidance, can create meaningful, coherent representations of knowledge.

Principle 3: Construction of knowledge

The successful learner can link new information with existing knowledge in meaningful ways.

Principle 4: Strategic thinking

The successful learner can create and use a repertoire of thinking and reasoning strategies to achieve complex learning goals.

Principle 5: Thinking about thinking

Higher order strategies for selecting and monitoring mental operations facilitate creative and critical thinking.

Principle 6: Context of learning

Learning is influenced by environmental factors, including culture, technology, and instructional practices.

Motivational and Affective Factors*Principle 7: Motivational and emotional influences on learning*

What and how much is learned is influenced by the learner's motivation. Motivation to learn, in turn, is influenced by the individual's emotional states, beliefs, interests and goals, and habits of thinking.

Principle 8: Intrinsic motivation to learn

The learner's creativity, higher order thinking, and natural curiosity all contribute to motivation to learn. Intrinsic motivation is stimulated by tasks of optimal novelty and difficulty, relevant to personal interests, and providing for personal choice and control.

Principle 9: Effects of motivation on effort

Acquisition of complex knowledge and skills requires extended learner effort and guided practice. Without learners' motivation to learn, the willingness to exert this effort is unlikely without coercion.

Developmental and Social Factors*Principle 10: Developmental influences on learning*

As individuals develop, they encounter different opportunities for and experience different constraints on learning. Learning is most effective when differential development within and across physical, intellectual, emotional, and social domains is taken into account.

Table 1. (Continued)*Principle 11: Social influences on learning*

Learning is influenced by social interactions, interpersonal relations, and communication with others.

Individual-Differences Factors

Principle 12: Individual differences in learning

Learners have different strategies, approaches, and capabilities for learning that are a function of prior experience and heredity.

Principle 13: Learning and diversity

Learning is most effective when differences in learners' linguistic, cultural, and social backgrounds are taken into account.

Principle 14: Standards and assessment

Setting appropriately high and challenging standards and assessing the learner and learning progress—including diagnostic, process, and outcome assessment—are integral parts of the learning process.

Note. Summarized from APA Work Group of the Board of Educational Affairs (1997).

curricula, and personnel to enhance the teaching and learning process. The implementation of technology affects this complex interaction, defining its effectiveness. The challenge, therefore, is to understand the nature of e-learning from the learner-centered perspective.

GENERAL IMPLICATIONS OF THE LEARNER-CENTERED PERSPECTIVE

Research underlying the learner-centered principles confirms that learning is nonlinear, recursive, continuous, complex, relational, and natural in humans. Research also shows that learning is enhanced in contexts where learners have supportive relationships, have a sense of ownership and control over the learning process, and can learn with and from each other in safe and trusting learning environments (McCombs, 2003; McCombs & Whisler, 1997). In much of the traditional K–20 educational system and as reflected in some e-learning contexts, however, learners can often feel isolated, and learning can often be characterized as simplistic and rote, with a focus on linear teaching of knowledge and skill standards. Showing great promise for changing this paradigm are technologies that support electronic learning and networked learning communities. Positive impacts through Web-based technologies now make it possible to support complex nonlinear learning in ways that connect individual learners in meaningful dialogue, learning, and change across traditional boundaries of teachers, students, schools, classrooms, and individual communities. Web-based learning communities are fast

becoming a reality that can transform practice beyond traditional models and boundaries of schools and educational systems.

In learner-centered electronic learning environments, all people associated with the system are learners whose status changes from novice to expert as tasks and goals change. The boundaries are limited only by imagination and need for access to expertise as learning needs and opportunities change in response to dynamic curriculum objectives. Content is digitally constructed and customized to meet individual learner needs, abilities, interests, goals, and other characteristics—including their dynamic and changing roles from novice to expert learners. Concepts such as “just-in-time learning” and “learning anytime, anywhere” describe the dynamic learning environment and Web-based learning communities that revolve and evolve around inquiry-based learning tasks. All learners have opportunities to connect with each other at personal and academic levels. Additional positive features include the following:

- Practices integrate learning and motivational strategies to help students become self-directed learners.
- Instruction includes preassessments and ongoing assessments of students’ interests, goals, background knowledge, and needs to better tailor practices to each individual.
- Mechanisms are in place to better connect other learners in learning communities and/or communities of practice.
- Students are involved in co-creating instruction and all instructional experiences with their “teachers” and others in their learning communities.
- Practices address both community and individual personal needs; community is not defined geographically, but by shared interest in the subject matter and adaptability.
- Concepts of “emergent” curricula are at the heart of the system; each learner or community of learners can, at any period of time and based on their needs/purposes, create curricula that include dynamic and up-to-date information.
- Curriculum is customized based on preassessment and ongoing assessment data to allow learners the opportunity to see the progress they are making.
- Curriculum is flexible and dynamic, with a minimum of structure based on student needs and/or developmental considerations.
- Feedback is available for student review “on call,” so that it can be used for self-evaluation of progress; it is available for others to see when

students are “ready” to submit work; feedback provides ways for students to remediate and enrich their knowledge and skills in areas of choice as appropriate.

THE GEN Y EXAMPLE OF LEARNER-CENTERED PRINCIPLES IN PRACTICE

One example that integrates the learner-centered principles into practices consistent with the foregoing list is the Generation Y (Gen Y) program developed by Dennis Harper (1998, 2002) in the Olympia, Washington, School District. Gen Y students in Grades 3–12 are involved in collaboration with teachers, the local community, higher education, and corporate sponsors to assist in the restructuring of education through emerging technologies. These students are seen as partners and leaders in integrating technology into lesson plans and units. Results of this program show that students can greatly contribute to transformed practices and in so doing, improve their motivation for learning and relationships with adults. This approach has led to greater student engagement in learning and also to increased school attendance and reduced discipline problems (Coe & Ault, 2001). New positive relationships have been formed between youth and teachers, and new school cultures of mutual respect and caring have emerged.

How is this program an example of learner-centered principles in practice? The primary ways in which Gen Y applies these principles are as follows:

- Gen Y students and teachers are partners in co-creating curricula and lesson plans that integrate technology in personally meaningful and relevant ways to students.
- Gen Y students and teachers select curricula for enhancement with technology based on difficulty and/or interest level, thereby representing dynamic, negotiated, and emergent curricula defined by local school communities and based on learning needs.
- Teachers empower Gen Y students to “teach” the lesson with them in ways that are engaging to other students in the class.
- Technology-enhanced curricula that are co-created by Gen Y students and teachers become part of a national database that other teachers and students can access, enabling them to adapt these lessons to their own teaching and learning needs.
- The technology-enhanced curricula in the Gen Y student-teacher partnership model accommodate roles of teachers as learners and learners as teachers, thus strengthening the relationship between teachers and students.

Table 2. The Gen Y example of learner-centered principles in practice

Program Features	Learner-centered factors	Learner-centered principles
Student creates personally relevant learning activities with technology in partnership with teachers.	Cognitive and metacognitive	Principle 1: Nature of the learning process. Principle 3: Construction of knowledge. Principle 4: Strategic thinking. Principle 6: Context of learning.
Student and teacher have a new learning and social relationship defined in part by their partnership roles in co-creating lessons.	Motivational and affective Developmental and social Individual differences	Principle 7: Motivational and emotional influences on learning. Principle 11: Social influences on learning. Principle 13: Learning and diversity.
Students learn about creating lessons that facilitate learning; teachers learn about student interests, learning needs, and technology applications.	Cognitive and metacognitive Individual differences	Principle 2: Goals of the learning process. Principle 12: Individual differences in learning.
Students "teach" lesson to other students in the class in partnership with teacher; they are coached in reaching students of diverse backgrounds.	Cognitive and metacognitive Motivational and affective Developmental and social	Principle 5: Thinking about thinking. Principle 8: Intrinsic motivation to learn. Principle 10: Developmental influences on learning. Principle 11: Social influences on learning.
Students are empowered to be more engaged and take responsibility for their own learning, leading to increased school attendance and fewer discipline problems; become models for other students.	Motivational and affective Individual differences	Principle 9: Effects of motivation on effort. Principle 14: Standards and assessment.

• Gen Y students and their teachers define the assessment and feedback strategies in ways that establish appropriate levels of choice and development of student responsibility for learning outcomes.

How these features relate to the *Learner-Centered Psychological Principles* is further exemplified in Table 2, which clarifies that when the learner-cen-

tered principles are applied as a framework, they systematically and holistically address all domains of human functioning that are part of learning. By extension, these same features can become design criteria for e-learning experiences that are part of distance learning programs.

SPECIFIC IMPLICATIONS FOR CREATING LEARNER-CENTERED E-LEARNING PRACTICES

The Gen Y program exemplifies how learner-centered practices can be applied in an innovative technology-based program. Learner-centered principles can also be applied to an e-learning environment where technology becomes a key ingredient in the processes that affect learner-centeredness. Unfortunately this has not been the case in all e-learning environments. Zucker and Kozma (2003) observe that virtual high schools, in their attempt to gain acceptance by traditional educators, "minimize their innovativeness of virtual programs and their ability to contribute to educational reform and change" (p. 120). Virtual high schools emulate the current systems such as credit hours, schedules, and assignments instead of taking advantage of the medium for change and learner-centered practices (Zucker & Kozma, 2003). Higher education also has "a lot to learn regarding how, and in what ways, technology can enhance the teaching/learning process, particularly at a distance" (Phipps & Merisotis, 1999, p. 35).

According to Wagner and McCombs (1995), "distance education provides a unique context in which to infuse learner-centered principles" (p. 32). The learner-centered principles can provide a framework by which distance educators can infuse learner-centered principles and make inferences as to the nature of the learning supports and learning activities. "Fourteen individual statements are helpful but not enough. Teachers need assistance in identifying opportunities for the use of these principles in instruction and in evaluating their effectiveness" (Bonk & Cunningham, 1998, p. 32). By providing a theoretical framework with practical application to an e-learning environment, the model can serve as a basis for future research in the effectiveness of online education and as a guideline for infusing learner-centered principles in an online environment.

The following is our initial attempt based upon a review of the literature to apply the APA learner-centered principles to online learning. Our research-based recommendations and implications have been organized into the four domains of the learner-centered psychological principles (cognitive and metacognitive factors, motivational and affective factors, developmental and social factors, individual-differences factors) that they primarily address. This review has not identified an e-learning program or school that exemplifies learner-centered practices in their entirety similar to the Gen Y program but has identified isolated courses and research studies that

evidence effective learner-centered practices. "A major gap in the research is the lack of studies dedicated to measuring the effectiveness of total academic programs taught using distance learning" (Phipps & Merisotis, 1999, p. 11). The following are thus some of the more important *practice* implications from our review that include ways to *build communities of learners* (with references cited to some of the supporting literature).

Cognitive and Metacognitive Factors

- Design learning supports relevant to online activities, because learning processes and strategies that learners have developed over time may not work in an online learning environment (Hardy & Boaz, 1997).
- Create nonlinear and individualized linkages to existing and new information (Jonassen, 1996; Thorsen, 1998).
- Provide access to real-time data and experts in fields of study (Bransford, Brown, & Cocking, 1999; McKinnon & Nolan, 1999) and to real-world tasks such as virtual simulations, real-time data, creating media clips, and student-created Web pages (Bransford et al., 1999; Goodyear & Steeples, 1999).
- Provide ways to make unobservable learning (e.g., strategic thinking) available for reflection as well as online supports, allocations of time, and multiple passes through electronic conferences that can support meta-cognition and reflection on the learning process (Palloff & Pratt, 1999; Vakili, 2001).
- Develop digital literacy and strategic thinking through searching, questioning, and discovering appropriate sources and uses of electronic information and a variety of resources (Bates, 1997; Gilster, 1997).
- Focus on inquiry and problem-based learning supports (e.g., spreadsheets, science probeware, databases) to developing problem solving skills (Jonassen, Previs, Christy, & Stavroulakis, 1999).
- Provide ways for student to elaborate on and organize information (Thorsen, 1998) and allow for analysis, synthesis, and evaluation of learning (Phipps & Merisotis, 2000).
- Actively involve students in discussing problems, participating in projects, and responding to activities (Egan & Gibb, 1997).
- Convey difficult concepts with video conferencing and audio-graphics software in a constructivist approach (Harmon & Dorman, 1998).
- Support collaboration (e.g., with computer conferencing, chats, Use-Net groups, multiple-user dimensions [MUDs], MUDs object-oriented

[MOOs]) as an essential way for learners to construct their own knowledge, dialog and share with others, and contribute to a group (Jonassen, 2000; Jonassen et al., 1999).

Motivational and Affective Factors

- Avoid the assumption that online learners are those who prefer less personal contact with instructors, are independent learners, have high motivation to learn, are self-disciplined, and have high personal self-efficacy; this assumption is not warranted for a growing number of students (Wagner & McCombs, 1995).
- Provide technical support such as needs assessment, prerequisites, 800 numbers, e-mail, peer networks, real-time chats, instant messenger software, and online tutorials (Phipps & Merisotis, 2000; Vakili, 2001).
- Support exploration of meaning in a context where learner feels accepted, safe, challenged but not threatened, and encouraged to take risks (Combs, 1976).
- Use Socratic questioning to probe learning that occurs, as well as ongoing feedback and guided practice that helps learners become self-directed and motivated (Vakili, 2001).
- Provide opportunities for personal control and choice in areas such as types of learning activities, criteria for evaluating learning progress and outcomes, and specific technologies to use for learning activities (Christensen, Anakwe, & Kessler, 2001; Harper, 2002; McCombs, 2001b).
- Provide interactivity that is directly related to student perceptions about quality of the learning experience (Wagner, 1997).
- Encourage motivation through opportunities for role taking, debate, and outside mentoring (Bonk & Dennen, 1999).
- Allow students to create electronic portfolios and other authentic assessments such as student self-evaluations and rubrics that define online participation (Palloff & Pratt, 1999).
- Incorporate initial and ongoing needs assessments that provide choice of activities and create optimally challenging environments; let learners make choices and see results in a simulated environment (Bransford et al., 1999; Egan & Gibb, 1997).
- Provide ways for students to globally assess and evaluate class discussions and share feedback with peers and instructor, increasing motivation with work displayed (Bonk & Dennen, 1999).

Developmental and Social Factors

- Structure opportunities for personal contact and develop communicative and social online activities to foster community and assist students in reducing feelings of isolation (Barab, Makinster, Moore, Cunningham, & IFL Design Team, 2001; Haythornwaite, Kazmer, Robins, & Shoemaker, 2000).
- Provide ways for students to partner with teachers to teach them about technology, such as encouraging two-way communication and feedback relative to course expectations between students and teachers (Phipps & Merisotis, 2000; Sherry & Wilson, 1997).
- Create hyperlinks to resources and discussions to aid in scaffolding learning and helping learners to reach the next level of development (Vakili, 2001).
- Provide online facilitators to structure online communication, develop community, and provide social cues to encourage social interactions, create trust, and generate a sense of community (Mather, 2000; Vakili, 1996).
- Create electronic spaces dedicated to social interaction, such as a student union, an electronic yearbook, and an electronic coffeehouse for social messaging (Haythornwaite et al., 2000), and view the use of technologies as critical to the learning process and ensure that the use facilitates interactivity (Christensen et al., 2001).
- Use online games as a way to build teams, lower fear, encourage collaboration, and allow for interaction with the technical interface of a course (Vakili, 2001).
- Allow students a role in creating the learning environment and the social norms for the learning community, including assisting in the online team building and ice-breaking activities (Ko & Rossen, 2001).
- Allow learners to assume new or untraditional roles, with new role playing and simulation opportunities for conversation and learning (Bransford et al., 1999).
- Utilize video and audio conferencing technologies for one-on-one and group dialogue (Barab et al., 2001), with opportunities for learners to redefine community with the removal of social and visual cues, a focus on message conveyed, and learning activities that allow students to develop electronic personalities via role playing or simulations (Palloff & Pratt, 1999).

Individual-Differences Factors

- Determine entry-level characteristics, behaviors, and skills in preassessments (Wagner & McCombs, 1995).
- Provide multiple ways of displaying materials electronically, such as lists of lesson objectives for concrete-sequential learners and semantic maps for graphically representing the same information for other types of learners (Cyrs, 1997).
- Create multiple pathways through text, graphics, audio, video, or animation that allows more learners to take advantage of the nonlinear and individualized learning features of online environments (Mather, 2000; Thorsen, 1998)
- Allow multiple means for expression to build a diverse and inclusive learning community that supports global learning and cultures of learning (Barab et al., 2001).
- Use strategies for individualizing learning such as nonlinear branching, multiple media, negotiated time schedules, and different learning structures (Jonassen, 1996; Simonson, Smaldino, Albright, & Zvacek, 2000).
- Use a variety of technologies such as multimedia and streaming technologies to appeal to different learning styles and meet the needs of students with disabilities (Black, 2001; Mather, 2000).
- Allow up to 50% of the course to be online discussion, with online rubrics that evaluate the quality and quantity of contributions, timeliness, and significance of contribution to overall discussion (Ko & Rossen, 2001).
- Provide ways for assignments to be graded electronically via a variety of assessments and have electronic feedback and grades available to students (Palloff & Pratt, 1999).

Furthermore, in keeping with these specific implications, the characteristics of a developmentally appropriate framework to *support ongoing, lifelong learning* will:

- Move from more structured to less structured supports and protocols for interacting as learners gain in experience and sophistication.
- Provide various levels of learner choice and control to match the needs, experience, and interests of different types of learners, young and old.
- Enlist various levels of mentoring and guidance as well as limits to the boundaries of the learning community based on learner needs, experience, and interests.

- Provide various levels of direction and structure for academically related inquiries that match the interests, experiences, and skill levels of learners.
- Allow for a range of individual and group approaches and topics that are matched with both required academic standards and individual needs, interests, and skill levels.
- Support an ongoing process of learning and change, allowing for exploration and various levels of learning depending on interests, experiences, and skill levels.
- Provide opportunities for intergenerational learning around topics of interest and relevance across the age span.

An important property in these implications is the degree to which they converge with the more general implications in the previous section. In summary, the overriding framework to guide the development of e-learning communities and cultures for all learners is one that (a) recognizes the holistic nature of learning as involving the four domains identified in the learner-centered principles; (b) provides strategies that align the characteristics of technology with learner needs in a nonlinear and dynamic learning process; (c) facilitates the forming of relationships and communities of learners that support the notion of learning as a partnership among all learners; and (d) acknowledges that the roles of teacher and student dynamically change as different levels of expertise are acquired.

CONCLUDING COMMENTS

The key issues in using educational technology to support learner-centered principles and practices are:

- Building ways to meet learner needs for interpersonal relationships and connections.
- Finding strategies that acknowledge individual differences and the diversity of learner needs, abilities, and interests.
- Tailoring strategies to differing learner needs for personal control and choice.
- Assessing the efficacy of technology to meet diverse and emerging individual learner and learning community needs.

As an overriding principle, *it is necessary to look for not only the match or mismatch of technology uses with learning principles, but also its match or mismatch with learners and their diverse needs.* A balance of personal and technical sup-

ports can then be provided with technology-supported learning opportunities, content, and communities. In the case of many new distance learning opportunities, it is easy to overlook the central role that learner-centered principles can play—not only in holistically addressing learner and learning needs, but also, in so doing, increasing student motivational, social, and academic learning outcomes.

The learner-centered framework provides a foundation for transforming education, inclusive of the potential role of technology. Technology can be used to change the role of teachers to that of colearners and contributors to the social and interpersonal development of students, counterbalancing the potential of computer technology to cause personal and social isolation and alienation. Online delivery of education can then provide a means to centralize course development and link intergenerational learners to academic tutors on a global scale. As those associated with distance learning at the Open University have learned, meeting these needs can drastically increase student retention in online courses and degree programs (J. Haywood, personal communication, June 15, 2001).

These changes can be difficult. Resistance to technology is one contributing factor; however, a learner-centered e-classroom is not just dependent upon technology but also dependent upon political, organizational, cultural, and psychological factors (Dede, 1998). As changes to the definition of “schooling” occur, the possibilities afforded by e-learning grow or diminish dependent upon these other factors. E-learning may grow, but it may not grow in keeping with a learner-centered framework. Teamwork, project-based learning, advanced learning skills, and solving real-world problems may become fads in the educational reform movement regardless of whether learning occurs in a technology medium. For technology to be integral to these and other educational reforms, a real challenge will be the preparation of teachers. They must fundamentally understand learner-centered principles of learning that are embedded in technology applications ranging from those in face-to-face classrooms such as the Gen Y program to e-classrooms in virtual high schools or in higher education.

Providing a context and opportunities for networking and collaboration is an important feature of learner-centered cultures that must be addressed in setting up technology-supported learning communities. *Inquiry* and *collaboration* are key processes for building technical skills and reflective thinking as an integral part of the learning process. The resulting learning communities must themselves be a model of the processes to be engendered in learners. To produce quality learners, all learners must experience both quality content and processes. Time for learning and change must be provided, along with time to share successful practices, experiment, make mistakes, and continually improve.

In e-learning communities, a challenge to implementing a learner-centered framework occurs because of the distance and time separation between the instructor and the student. How can we build a community that supports inquiry and collaboration in an online environment? According to Moore (1993), physical separation can lead to communication and psychological distancing. E-learning in virtual high schools is currently highly dependent upon text (Zucker & Kozma, 2003) and by its very nature separates learners and teachers. E-learning must take advantage of new technologies such as visualization, simulation, and modeling (Zucker & Kozma, 2003) to help increase networking and collaboration and reduce communication and psychological distancing.

In conclusion, from a learner-centered perspective, e-learning technology can bring the promise of providing the tools and capacity for networked learning communities to expand and transform notions of learning and schooling in ways that produce healthy and productive lifelong learners. However, we must not be swayed through "hyperbole and exaggeration [which] have certainly been common features of online learning and technology-based education reform" (Zucker & Kozma, 2003, p. 15). The learner-centered framework adds a constant reminder that the human element cannot be left out of even the most advanced technology-supported networked learning communities. Beyond that, it must be recognized that one of the biggest factors to the success of information technologies in learning, aside from the people involved, is the context of safety and support for learning that is established. One of the biggest challenges is to design educational systems where technology is in service to learners. The paradigm must value and support diverse learners and learning contexts anytime, anywhere.

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